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Claims

[c1] 1. A two-layer transition duct body without longitudinal welds comprising an inside layer made of a heat resistant material and an outside layer made of a different material.

[c2] 2. A three-layer transition duct body without longitudinal welds made from three concentric cylinders having anti-fretting coatings between the cylinder surfaces.

[c3] 3. A method of making a multilayer transition duct body without longitudinal welds comprising the steps of
providing a plurality of pieces of tubular duct material of substantially the same diameter,
changing the temperature of at least one of the pieces sufficient to change its diameter by thermal expansion to a degree that permits a cooler piece to fit inside a warmer piece,
inserting the cooler piece inside the warmer piece to make multilayer tube material, and
hydroforming a multilayer transition duct body from the multilayer tube material.

[c4] 4. The method of claim 3, further comprising the step of

coating one of the mating surfaces of the tube material with an anti-fretting coating before inserting the cooler piece into the warmer piece.

[c5] 5. A method of making gas turbine transition duct bodies without longitudinal welds comprising the steps of
providing at least one hemispherical bellows thruster having a bellows structure,
structural welding an bellows thruster to each open end of a duct body such that the duct body is capable of containing internal pressure,
removably securing a pressurizing means to at least one of said bellows thrusters capable of pressurizing the inside of a duct body, and
hydroforming the transition duct body in a hydroforming press to a pressure less than the capacity of the hydroforming press.

[c6] 6. The method of claim 5, wherein the bellows structure is uniform around the axis of the hemispherical bellows thruster.

[c7] 7. The method of claim 6, wherein the bellows structure comprises one ripple around the axis of the bellows thruster.

[c8] 8. The method of claim 5, wherein the bellows structure

is non-uniform around the axis of the hemispherical bellows thruster.

[c9] 9. The method of claim 8, wherein the bellows structure comprises at least two ripples on one side of the bellows thruster, and one ripple on the other side of the bellows thruster.

[c10] 10. The method of claim 5, wherein the hemispherical bellows thruster bellows structure is adapted to supply more lateral force to the duct body during hydroforming than hemispherical bellows thrusters without bellows.

[c11] 11. The method of claim 8, wherein the hemispherical bellows thruster bellows structure is adapted to supply more lateral force to one side of the duct body during hydroforming than the other.

[c12] 12. The method of claim 5, further comprising the step of providing a pair of hydroforming dies that when assembled form at least two hemispherical recesses sized to communicate with hemispherical bellows thrusters secured to the duct body during hydroforming.

[c13] 13. The method of claim 5, adapted to form two transition duct bodies in a back-to-back arrangement, said hydroforming press comprising dies shaped to form two transition duct bodies in a back-to-back arrangement.

[c14] 14. The method of claim 5, wherein the duct body is a multi-layer transition duct body.

[c15] 15. The method of claim 14, wherein an anti-fretting material is disposed between an inner layer and an outer layer of the multi-layer transition duct body.